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User's Manual for Single Source (CRSTER) Model (Addendum/Supplemental Information)

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16. Abstract (Limit: 200 words)

This supplemental information on the CRSTER model is part of the documentation of the UNAMAP Version 5 package. It enables users to update their guide for this model. The coding changes documented in the report have already been made to the source code included as part of the UNAMAP Version 5 tape.

17. Document Analysis a. Descriptors

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ADDENDUM/SUPPLEMENTAL INFORMATION

TO THE

USER'S MANUAL FOR SINGLE SOURCE (CRSTER) MODEL

The computer code modifications addressed herein are the complete set of changes made to date to the CRSTER code as it appears in the User's Manual for Single-Source (CRSTER) Model, EPA-450/2-77-013, July 1977. All modifications have been incorporated in the CRSTER code as part of the UNAMAP-4 available from the National Technical Information Service (NTIS).

Each item in this report is preceeded by the date on which it was issued.

A. 9/79 - Additional Options

Several options have been added to the CRSTER computer program. These options potentially make the model more useful for a variety of applications. However, please note that the inclusion of the options does not constitute a change in the recommended procedures. The options are therefore to be exercised for regulatory applications only with the concurrence of the appropriate Regional Office.

The following list identifies the options that have been added to the CRSTER program:

- transitional plume rise
- anemometer height input
- wind profile power-law exponent input
- stack downwash
- momentum plume rise

The new namelist variables associated with these options are as follows:

Variable Name	Type	Description
IPLAS	Integer	0 = Transitional plume rise not accounted for. 1 = Transitional plume rise accounted for. Default = 0 Current recommended usage: IPLAS = 0
ANHT	Real	Anemometer height. Default = 7. meters. Current recommended usage: ANHT = Actual anemometer height.

IDWN	Integer	0 = Stack downwash not accounted for. 1 = Stack downwash accounted for. Default = 0 Current recommended usage: IDWN = 0
P	Real	Array of dimension 6. Positions 1-6 correspond to the set of wind profile law exponents as a function of stability. Default = .1, .15, .2, .25, .3, .3 Current recommended usage: P = Default values
IMOM	Integer	0 = Momentum plume rise not accounted for. 1 = Momentum plume rise accounted for. Default = 0 Current recommended usage: IMOM = 0

The momentum plume rise option allows the momentum plume rise equations to be used for cold plume sources. This option has no effect for sources with buoyant plumes - the sources for which CRSTER was originally designed to be used. Hence, the default for this option is to omit the momentum plume rise equation. However, since it may be necessary to consider sources with non-buoyant plumes, the option which includes the momentum plume rise equations may be used for such cases.

9/79 - Program Modifications Required to Incorporate Additional Options

I. Replace the following lines of code:

MAIN CRSV

```
     *Q240(12,20),V240(12,20),T240(12,20),ANHT,P(6),IPLAS,IDWN,IMOM                CV001300
     *ISC,SC1,SC3,SCN,SC24,SCAN,ANHT,P,IPLAS,IDWN,IMOM                            CV001700
```

SUBROUTINE CRS

```
      DIMENSION DTH(11),SYD(5,6),SZD(5,6),LOOP(6,2),
     *TAPIN(171),JMAX3(4),CHI(180),HE(20,5),DDD(366)                             CR000800
     *Q240(12,20),V240(12,20),T240(12,20),ANHT,P(6),IPLAS,IDWN,IMOM              CR001200
      WS(IS)=XWS*((HP(IS)/ANHT)**P(KST))                                         CR001900
      H=HE(IH,J)-FADJ                                                            CR016400
                                                                                 CR021800
```

SUBROUTINE BLK

```
     Q240(12,20),V240(12,20),T240(12,20),ANHT,P(6),IPLAS,IDWN,IMOM               BL000400
```

II. Delete the following lines of code:

SUBROUTINE CRS

```
     DATA P/.1,.15,.2,.25,.3,.3/                                                 CR002700
     HE(IS)=HEIS                                                                 CR018500
```

III. Add the following lines of code:

MAIN

```
      IF(IPLAS.EQ.1)WRITE(6,841)                                        CV009110
  841 FORMAT(1X,'GRADUAL PLUME ASCENT UP TO POINT OF FINAL ',           CV009120
     1'RISE ACCOUNTED FOR')                                             CV009130
      WRITE(6,842)ANHT                                                  CV009140
  842 FORMAT(1X,'ANEMOMETER HEIGHT IS ',F4.1,' METERS')                 CV009150
      IF(IDWN.EQ.1)WRITE(6,843)                                         CV009160
  843 FORMAT(1X,'STACK DOWNWASH ACCOUNTED FOR')                         CV009170
      IF(IMOM.EQ.1)WRITE(6,844)                                         CV009180
  844 FORMAT(1X,'MOMENTUM PLUME RISE ACCOUNTED FOR')                    CV009185
      WRITE(6,845)P                                                     CV009190
  845 FORMAT(1X,'WIND PROFILE EXPONENTS ARE: ',6(F7.3,','))             CV009195
```

SUBROUTINE CRS

```
      IF(IDWN.EQ.0) GO TO 1779                                          CR018110
C***ACCOUNT FOR STACK DOWNWASH                                          CR018115
      DUD=VS(IS)/WS(IS)                                                 CR018120
      IF(DUD.LT.1.5)HPIS=HP(IS)+2.*D(IS)*(DUD-1.5)                      CR018130
      IF(HPIS.LT.0.)HPIS=0.                                             CR018140
 1779 CONTINUE                                                          CR018150
      IF(IMOM.EQ.0)GO TO 1801                                           CR018203
C***MOMENTUM PLUME RISE ACCOUNTED FOR                                   CR018206
      DELT=TSIS-T                                                       CR018209
      IF(KST.GT.4)GO TO 1802                                            CR018212
      VFIS=0.785398*VS(IS)*D(IS)*D(IS)                                  CR018215
      DUMF=3.12139*VFIS*DELT/TSIS                                       CR018218
      IF(DUMF.GE.55.)GO TO 1783                                         CR018221
      DTMB=.0297*TSIS*VS(IS)**0.333333/D(IS)**0.666667                  CR018224
      GO TO 1784                                                        CR018227
 1783 DTMB=.00575*TSIS*VS(IS)**0.666667/D(IS)**0.333333                 CR018230
 1784 CONTINUE                                                          CR018233
      IF(DELT.GE.DTMB)GO TO 1801                                        CR018236
      HEIS=HPIS+3.*VS(IS)*D(IS)/WSIS                                    CR018239
      GO TO 1803                                                        CR018242
```

```
 1802 CONTINUE                                                          CR018245
      S=9.80616*DTHDZ/T                                                 CR018248
      DTMB=0.019582*T*VS(IS)*SQRT(S)                                    CR018251
      IF(DELT.GE.DTMB)GO TO 1801                                        CR018254
      DHA=3.*VS(IS)*D(IS)/WSIS                                          CR018257
      DELHF=1.5*(VS(IS)*VS(IS)*D(IS)*D(IS)*T/(4.*TSIS*WSIS))**0.333333/ CR018260
     *S**0.166667                                                       CR018263
      IF(DHA.LT.DELHF)DELHF=DHA                                         CR018266
      HEIS=HPIS+DELHF                                                   CR018269
 1803 CONTINUE                                                          CR018272
      DO 1804 J=1,5                                                     CR018275
      HE(IS,J)=HEIS                                                     CR018278
 1804 CONTINUE                                                          CR018281
      GO TO 1800                                                        CR018284
 1801 CONTINUE                                                          CR018287
      IF(IPLAS.EQ.1)GO TO 1781                                          CR018296
      DO 1780 J=1,5                                                     CR018410
      HE(IS,J)=HEIS                                                     CR018420
 1780 CONTINUE                                                          CR018430
      GO TO 1800                                                        CR018440
C***ACCOUNT FOR TRANSITIONAL RISE UP TO POINT OF FINAL RISE             CR018445
 1781 DO 1782 J=1,5                                                     CR018450
      RDIS=RNG(J)                                                       CR018460
      CALL BEH072(DUMHX,HEIS,DUMHMW,DUMF,DHA,DUMDSF,DUMDHX,             CR018470
     *HPIS,TSIS,DUMVS,DUMD,VFIS,KST,WSIS,RDIS,DTHDZ,T,DUMP)             CR018480
      HE(IS,J)=HEIS                                                     CR018490
 1782 CONTINUE                                                          CR018495
```

SUBROUTINE BLK

```
      DATA P/.1,.15,.2,.25,.3,.3/                                       BL001500
      DATA ANHT/7./                                                     BL001600
      DATA IPLAS/0/                                                     BL001700
      DATA IDWN/0/                                                      BL001800
      DATA IMOM/0/                                                      BL001900
```

B. Computer Program Modifications

Several program modifications are described below. Some changes are cosmetic or produce a code more compatible with a variety of computer systems. Others may affect the output of the model slightly; however, the effect is of no consequence for applications in which CRSTER is most commonly used.

Make the following program line modifications to Appendix A of the User's Manual and check your computer programs for conformance.

PREPROCESSOR PROGRAM

1. 8/78 - In line METO3040 change ' Day ',I2, to ' DAY ',F4.0,.

2. 9/79 - Remove the statement number 220 from line METO2040.

3. 9/79 - Insert the following line of code:

```
      220 CONTINUE                                                    METO2041
```

SINGLE SOURCE CRSTER MODEL PROGRAM

1. 8/78 - Insert the following line of code:

```
      IF(ELEV(I7,I8).LT.PELEV)GADJ(I8,I7)=0.0                         CV022910
```

   The addition of this line of code will reposition the receptors that are below ground elevation of the plant to plant elevation. This prevents concentration estimates from being unrealistically low for receptors at elevations lower than the plant. This line of code was inadvertantly omitted from the original program.

2. 8/78 - Delete lines CV002000 and CV002100.

3. 8/78 - Insert the following lines:

```
      IMET=1                                                          CV002710
      IPTZ=0                                                          CV002720
```

4. 8/78 - Remove statement numbers 152, 816, and 515 respectively from lines CV013200, CV016400 and CV027700, and change the NS in line CV026400 to I2.

5. 8/78 - Remove IHC(4), from line CR000800.

6. 8/78 - Remove IHC, and 6,13,18,24, from line CR002700.*

7. 8/78 - Delete lines CR008600, CR068800, CR068900, CR071300 and CR071400.

*This modification is not required if the options under Section A herein are employed.

8. 8/78 - Insert a comma after:

   TABLE' in line CR045500,
   '/' in line CR061400,
   '/' in line CR061800 and
   CO' in line CR067000.

9. 8/78 - Remove ,KSTL from lines CV027700 and CR000100.

10. 8/78 - Remove TX3(2),TX4(2), from line BL000200.

11. 9/79 - Insert the following line of code:

```
      IF(KST.GE.5) GO TO 2350                                    CR023210
```

    4/80 - Change the following line of code to read:

```
      IF(CHEK.GE.1.6.AND.KST.LT.5)GO TO 2400                     CR022400
```

    12/80 - Change the following line of code to read:

```
      IF(KST.LT.5.AND.H.GT.XMH)GO TO 2800                        CR022000
```

    The addition/modification of these lines of code prevent inappropriate limited mixing under stable conditions in the rural mode. This may have a slight affect on concentrations for stable conditions; however this has no effect on design concentrations for applications in which CRSTER is most commonly used.

12. 9/79 - Change the following lines of code to read as follows:

```
C   BEH072   (BRIGGS EFFECTIVE HEIGHT)  September 79              BE000300
C    THIS DIFFERS FROM THE OCT. 1972 VERSION IN STATEMENT 24+1:    BE000400
C     THE CONSTANT 2.6 PREVIOUSLY WAS 2.4.                         BE000500
C                                                                  BE000600
       DHA  = 2.6*(F/(U*S))**0.333333                              BE010300
```

    The code in line BE010300 is the equation for plume rise for the stable case as it is currently recommended by Briggs*. The constant "2.6" represents a change from Briggs' previously recommended value of "2.4", which was used in the original CRSTER code. This change causes the plume rise under stable conditions to be somewhat greater; however, this has no effect on design concentrations for applications in which CRSTER is most commonly used.

*Briggs, Gary A., 1972: Discussion on Chimney Plumes in Neutral and Stable Surroundings. Atmos. Environ. 6, 507-510 (July 72)

13. 9/79 - Delete lines CR015700 and CR015800 and replace with the following five lines:

```
C***IF STABILITY=7,SET KST AND KSTL TO 6.                          CR015700
      IF(ISTAB(IHR).LT.7) GO TO 1631                               CR015800
      KST=6                                                        CR015810
      KSTL=6                                                       CR015820
 1631 CONTINUE                                                     CR015830
```

The replacement of these lines of code will effectively reset all stability class 7 values to 6 and calculate a concentration for the time period involved. Since CRSTER was originally designed for relatively tall stacks with hot plumes and since stability class 6 results in nearly zero ground level concentrations, CRSTER was originally coded to assign a zero for the occurrence of stability class 7. However, to maintain consistency with the RAM and MPTER models which have been designed to accommodate, in addition, low level sources for which the stable conditions of stability class 6 may produce significant concentrations, the calculation of concentrations in CRSTER for stability class 7 (extremely stable) conditions is necessary. This change, though, will have no effect on design concentrations for applications in which CRSTER is most commonly used.

14. 9/79 - Insert the following lines:

```
      DATA HV1,HVX,HV3,KV1,KVX,KV3/150*0.0,150*0/                  CR002410
      IG=51-KIG                                                    CR031610
      IG=51-KIG                                                    CR036810
      IG=51-KIG                                                    CR042210
```

15. 9/79 - In lines CR031600, CR036800 and CR042200 change IG=50,2,-1 to KIG=1,49.

16. 12/80 - Change the following lines of code to read as follows:

```
C--CRSTER--UNEVEN TERRAIN MODEL--REVISED-12/80                     CV000100
*'  EMISSION UNITS: GM/SEC  ', ' AIR QUALITY UNITS: GM/M**3 12/80')  CV003800
```

These modifications allow for the continued identification of the revisions made to the CRSTER computer code.

17. 12/80 - Change the following lines of code to read as follows:

```
     *HLH(2,24),WS(20),HP(20),TS(20),TITLE(20),IDENT(5),VF(20),D(20), CR000600
     *TAPIN(123),JMAX3(4),CHI(180),HE(20,5),DDD(366)                 CR001200
8042 IF(IMET.EQ.0)GO TO 1199                                         CR012600
      WRITE(6,1500)TAPIN,((HLH(I,J),J=1,24),I=1,2)                   CR012900
      XMH =HLH(IUR,IHR)                                              CR014500
```

12/80 - Delete lines CR011500 through CR012500

These modifications eliminate the need to restructure the mixing height arrays as read from the preprocessor file.

18. 12/80 - Delete the following line of code;

```
      IDIR=DIR/10.                                                    CR019100
```

12/80 - Add the following lines of code:

```
      IF(DIR.LT.0.0)IDIR=(DIR/10.)-0.005                              CR019110
      IF(DIR.GE.0.0)IDIR=(DIR/10.)+0.005                              CR019120
```

These modifications eliminate the possibility of calculating incorrect receptor directions due to computer hardware limitations which do not allow for the exact representation of whole numbers in decimal notation.

19. 12/80 - Insert the following lines of code:

```
      IVT3=0                                                          CR005010
      IVTV=0                                                          CR005020
```

12/80 - Change the following lines of code to read as follows:

```
8007  IVT3=IVT3+1                                                     CR035400
      IF(IVT2.NE.3)GO TO 8008                                         CR035500
      IVT3=0                                                          CR035600
      IVT1=IHR/3                                                      CR035700
```

12/80 - Delete lines CR035800 and CR035900

12/80 - Change the following lines of code to read as follows:

```
      CHIH=CHIH/3.0                                                   CR036500
8052  IVTV=IVTV+1                                                     CR040800
      IF(IVTV.NE.IVT)GO TO 8054                                       CR040900
      IVTV=0                                                          CR041000
      AVT=IVT                                                         CR041100
      IVT1=IHR/IVT                                                    CR041200
```

12/80 - Delete line CR041300.

These modifications eliminate the possibility of the 3-hour and variable hour counter being miscalculated due to computer hardware limitations which do not allow for the exact representation of whole numbers in decimal notation.

C. 8/78 - Input Form Correction

The format of the PREP INITIALIZATION CARDS form at the top of Figure C-1, PREPROCESSOR INPUT DATA CODING FORMS, page C-3, is in error and should be modified to be compatible with the format described in TABLE 4-1, PREPROCESSOR INITIALIZATION CARD FORMAT, on page 4-11 of the User's Manual.

D. 8/78 - Clarification of the Highest 50 Concentration Tables

Users should note that the highest 50 maximum daily concentration table allows only the highest of the 180 24-hour average receptor concentrations on each day to be a candidate for entry into the table. However, the highest 50 concentration tables for 1-hour, 3-hour and variable hour time periods allow all of the 180 receptor concentrations for the specified time period to be candidates for entry into their respective tables.

If one desires a high 50 maximum daily concentration table where all of the 180 receptor concentrations are candidates for entry, then the variable time option should be used. To accomplish this, the namelist variable IVT should be set equal to 24 and program line CV011600 on page A-13 should be modified to read:

```
(OR.IVT.EQ.12.OR.IVT.EQ.24)                    CV011600
```

E. 8/78 - Random Number Alternative

The preprocessor program requires a random number subroutine not supplied with the program. The subroutine calculates numbers to be used in the development of the hourly randomized wind flow vectors. However, the set of numbers in Appendix A of this Supplement should be used routinely. These numbers were used to derive the randomized wind flow vectors for the test case. They are the set used by EPA for regulatory applications. These numbers were computed by the Sperry Rand Corp. random number generator subroutine, RANDU, installed on EPA's UNIVAC 1110 computer; the random number seed used is 65549.

Each line of data in Appendix A contains the day number and 24 integers. The positions of the integers(1-24) identify the hours of that day for which the integers are to be used in the derivation of the randomized wind flow vectors. Using the numbers will require the user to effectively modify the preprocessor program such that the given integers get transferred into the integer variable IRAND in line MET01870 to properly coincide with the KHR hour of the IDY day.

F. 9/79 - Running Averages

A new subroutine has been developed for the purpose of calculating running averages. The subroutine, entitled RUN, has been written for the express use with the Single Source (CRSTER) Model. The use of the procedure is optional and allows for the selection of running 3-hour, 8-hour and/or 24-hour averaging times. For each averaging time selected the subroutine will produce a table of highest concentrations and a table of second highest concentrations for each of the 180 radial receptors defined. The second highest table values are determined using the criteria that there is one other non-overlapping value that is at least as high as the second highest value. This procedure is consistent with that stated in Issue 7B, OAQPS Guidelines for The Interpretation of Air Quality Standards, No. 1.2-008 (Revised February 1977). Also, for each averaging time selected a high-50 table will be produced. This table allows concentrations for different starting hours for the same day, direction and distance to be candidates for inclusion.

A note of caution, though, is in order for prospective users. Selection of all three averaging time options will cause an increase in the CRSTER model run time by approximately a factor of thirteen (13). Selection of one or two running averages will show proportionate increases.

Instructions for the installation and use of Subroutine RUN are given in the first 47 lines of code for the subroutine. The computer code can be found in Appendix B of this Supplement.

Appendix A

1	52877697158073685181464
2	0664013045953148256989l2
3	4084130328625614351213 51
4	0023560201179654731313 62
5	9814696932232492301164 26
6	07976026229059666925606 0
7	27497038487650198856265 9
8	3529199544313863247672 48
9	900803784851894758053489
10	57492988065790022173962 5
11	48787865691498157038005 3
12	2380122675232253036901 94
13	32738417576541501840254 2
14	87246068442175106097011 4
15	46249436116484707156873 4
16	0313866261566459053409 36
17	12387145860902862331225 3
18	43379632761159593394357 0
19	1190726615834457824815 20
20	37181792492074675319383 2
21	34341531946930422803012 3
22	65489616282711983091495 7
23	41443531930843476985111 4
24	03123617281231722666997 3
25	46895905865276405542414
26	69228070786006049582008 2
27	56552514567401802500250 0
28	14186103388029565224152 2
29	16952878737475984171368 2
30	9617426916638427658725 52
31	82657196082018302303520 7
32	72131030480083002603965 6
33	69793700905070642821743 7
34	59020046879422611906727 9
35	11096213809771960698086 2
36	03663032496690897196368 1
37	27402183822083966625361 1
38	29825468872564558729497 8
39	45954659580786672391730 6
40	38015201455830126113099 5
41	93450953145683792841981 5
42	07861072795526998157500 8
43	33853679069125282694692 9
44	89318614358531434980332 0
45	46002948772861977031522 7
46	7664215802092620800958 48
47	95685394289679046368835 8
48	0658519525982886338246 70
49	77781448223101503748276 9
50	33203241854766118164231 2
51	27852769617624802195900 4
52	48228280806857222568376 0
53	04408494818038867520039 1
54	02435795653009010096642 7
55	76658103564359976888591 1
56	89219767607004952521408 8
57	52469476354425061878959 8
58	21769877935329990523092 1
59	33014304103349636714396 9

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60 3321829628819988959333374
61 93344909711250024072984 3
62 32379832781900776370625 9
63 49702013184072738872343 1
64 44014195083598453738028 1
65 04414549252461535309146 4
66 86501505020736246653249 4
67 62206824485479563884501 8
68 37264694609068489900211 2
69 34341531946930422803012 3
70 65489616282711983091495 7
71 41443531930843476985111 4
72 03123617281231722666997 3
73 46895905865276640554241 4
74 69228070786006049582008 2
75 56552514567401802500250 0
76 14186103388029565224152 2
77 16952873737475984171368 2
78 96174269166384276587255 2
79 82657196082018302303520 7
80 72131030480083002603965 6
81 69793700905070642821743 7
82 59020046879422611906727 9
83 11096213809771960698086 2
84 03663032496690897196368 1
85 27402183822083966625361 1
86 29825468872564558729497 8
87 45954659580786672391730 6
88 38015201455830126113099 5
89 93450953145683792841981 5
90 07861072795526908157500 8
91 33853676069125282694692 9
92 89318614358531434980332 0
93 46002948772861977031522 7
94 76642158020926208009584 8
95 95685394289679046368835 8
96 06585195259828863382467 0
97 77781448223101503748276 9
98 33203241854766118164231 2
99 27852769617624802195900 4
100 48228280806857222568376 0
101 04408494818038867520039 1
102 02435795653009010096642 7
103 76658103564359976888591 1
104 89219767607004952521408 8
105 52469476354425061878959 8
106 21769877935329905230921
107 33014304103349636714396 9
108 33218296288199889593333 74
109 93344909711250024072984 3
110 32379832781900776370625 9
111 49702013184072738872343 1
112 44014195083598453738028 1
113 04414549252461535309146 4
114 86501505020736246653249 4
115 62206824485479563884501 8
116 37264694609068489900211 2
117 34341531946930422803012 3
118 65489616282711983091495 7
119 41443531930843476985111 4

120 03123617281231722666997 3
121 468959058652766405542414
122 692280707860060495820082
123 565525145674018025002500
124 141861033880295652241522
125 169528787374759841713682
126 961742691663842765872552
127 826571960820183023035207
128 721310304800830026039656
129 697937009050706428217437
130 590200468794226119067279
131 110962138097719606980862
132 036630324966908971963681
133 274021838220839666253611
134 298254688725645588729497 8
135 459546595807866723917306
136 380152014558301261130995
137 934509531456837928419815
138 078610727955269981575008
139 33853e7e0691252826946929
140 893186143585314349803320
141 460029487728619770315227
142 766421580209262080095848
143 956853942896790463688358
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146 332032418547661181642312
147 278527696176248021959004
148 482282808068572225683760
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164 372646946090684899002112
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169 468959058652766405542414
170 692280707860060495820082
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173 169528787374759841713682
174 961742e916e3842765872552
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178 590200468794226119067279
179 110962138097719606980862

180 03663032496690897196 3681
181 27402183822083966 6253611
182 29825466872564558729497 8
183 45954659580786672391730 6
184 38015201455830126113099 5
185 93450953145683792841981 5
186 078610727955269981575008
187 33853676066912528266946929
188 89318614358531434980332 0
189 46002948772861977031522 7
190 766421580209262080095848
191 95685394289679046368 8358
192 06585195259828866338246 70
193 77781448223101503748276 9
194 33203241854766118164231 2
195 27852769617624802195900 4
196 48228280806857222568376 0
197 04408494818038867520039 1
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202 21769877935329900523092 1
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204 33218296288199895933337 4
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206 32379832781900776 3706259
207 49702013184072738 3723431
208 44014195083598453738028 1
209 04414549252461535309146 4
210 86501505020736246 6532494
211 62206824485479563884501 8
212 37264694609068489900211 2
213 34341531946930422803012 3
214 65489616282711983091495 7
215 41443531930843476985111 4
216 03123617281231722666997 3
217 46895905865276640554241 4
218 69228070786006049582008 2
219 56552514567401802500250 0
220 14186103388029565224152 2
221 16952878737475984171368 2
222 96174269166384276587255 2
223 82657196082018302303520 7
224 72131030480083002603965 6
225 69793700905070642821743 7
226 59020046879422611906727
227 11096213809771960698086 2
228 03663032496690897196 3681
229 27402183822083966625361 1
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231 45954659580786672391730 6
232 38015201455830126113099 5
233 93450953145683792841981 5
234 07861072795526998157500 8
235 33853676069125282696492 9
236 89318614358531434980332 0
237 46002948772861977031522 7
238 76642158020926208009584 8
239 95685394289679046368 8358

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240 0658519525982886338246 70
241 77781448223101503748 2769
242 33203241854766118164 2312
243 27852769617624802195 9004
244 48228280806857222568 3760
245 04408494818038867520 0391
246 02435795653009010096 6427
247 76658103564359976888 5911
248 89219767607004952521 4088
249 52469476354425061878 9598
250 21769877935329990523 0921
251 33014304103349636714 3969
252 33218296288199895933 3374
253 93344909711250024072 9843
254 32379832781900776370 6259
255 49702013184072738872 3431
256 44014195083598453738 0281
257 04414549252461535309 1464
258 86501505020736246653 2494
259 62206824485479563884 5018
260 37264694609068489900 2112
261 34341531946930422803 0123
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263 41443531930843476985 1114
264 03123617281231722666 9973
265 46895905865276640554 2414
266 69228070786006049582 0082
267 56552514567401802500 2500
268 14186103388029565224 1522
269 16952878737475984171 3682
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272 72131030480083002603 9656
273 69793700905070642821 7437
274 59020046879422611906 7279
275 11096213809771960698 0862
276 03663032496690897196 3681
277 27402183822083966625 3611
278 29825468872564558729 4978
279 45954659580786672391 7306
280 38015201455830126113 0995
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284 89318614358531434980 3320
285 46002948772861977031 5227
286 76642158020926208009 5848
287 95685394289679046368 8358
288 06585195259828863382 4670
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290 33203241854766118164 2312
291 27852769617624802195 9004
292 48228280806857222568 3760
293 04408494818038867520 0391
294 02435795653009010096 6427
295 76658103564359976888 5911
296 89219767607004952521 4088
297 52469476354425061878 9598
298 21769877935329990523 0921
299 33014304103349636714 3969

300	332182962881998959333374
301	93344909711250024072984 3
302	3237983278190077e3706259
303	4970201318407273887234 31
304	44014195083598453738028 1
305	0441454925246153530914 64
306	8650150502073624665324 94
307	6220682448547956388450 18
308	372646946090e84899002112
309	343415319469304228030123
310	6548961628271198309149 57
311	41443531930843476985111 4
312	03123e1728123172266e6997 3
313	468959058652760405542414
314	69228070786006049582008 2
315	5e5525145674018025002500
316	14186103388029565224152 2
317	16952878737475984171368 2
318	9617426916638427658725 52
319	8265719608201830230352 07
320	7213103048008300260396 56
321	6979370090507064282174 37
322	5902004687942261190672 79
323	1109621380977196069808 62
324	03e6303249669089719636 81
325	2740218382208396662536 11
326	29825468872526455872949 78
327	459546595807866723917306
328	3801520145583012611309 95
329	9345095314568379284198 15
330	078610727955269981575008
331	3385367606912528269469 29
332	8931861435853143498033 20
333	4600294877286197703152 27
334	7ee42158020926208009584 8
335	95e8539428967904636e8835 8
336	0658519525982886338246 70
337	7778144822310150374827 69
338	33203241854 76e1181642312
339	2785276961762480219590 04
340	4822828080685722256837 60
341	0440849481803886752003 91
342	0243579565300901009664 27
343	7ee581035643599768885911
344	8921976760700495252140 88
345	5246947635442506187895 98
346	2176987793532999052309 21
347	3301430410334963671439 69
348	3321829628819989593333 74
349	9334490971125002407298 43
350	3237983278190077637062 59
351	4970201318407273887234 31
352	4401419508359845373802 81
353	0441454925246153530914 64
354	8650150502073624665324 94
355	6220682448547956388450 18
356	3726469460906848990021 12
357	3434153194693042280301 23
358	6548961628271198309149 57
359	4144353193084347698511 14

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3e0    0312361728123172266669973
3e1    468959058652766405542414
3e2    692280707860060495820082
3e3    565525145674018025002500
3e4    141861033880295652241522
3e5    169528787374759841713682
3e6    961742691663842765872552
```

Appendix B

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      SUBROUTINE RUN(A,B,C,CHI,TX1,TX2,IDAY,ISC,RNG)                    RN000100
C          9/10/79                                                       RN000200
C*** THE FUNCTION OF THIS SUBROUTINE IS TO CALCULATE AND PRINT RUNNING   RN000300
C    AVERAGES FOR 3-HOUR, 8-HOUR AND/OR 24-HOUR AVERAGING TIMES. THIS    RN000400
C    PROCEDURE WAS DEVELOPED FOR USE WITH THE SINGLE SOURCE CRSTER       RN000500
C    MODEL. TO ESTABLISH THIS SUBROUTINE, ONE NEED ONLY ADD THE          RN000600
C    FOLLOWING CALL STATEMENTS TO THE CRSTER ROUTINES INDICATED BELOW:   RN000700
C                                                                        RN000800
C     MAIN CRSV                                                          RN000900
C                                                                        RN001000
C      CALL RUN(SOURCE(1),SOURCE(2),SOURCE(3),GADJ,TX1,TX2,DAY,ISC,RNG)  RN001100
C      CALL RUN(SOURCE(1),SOURCE(2),SOURCE(3),GADJ,TX1,TX2,DAY,ISC,RNG)  RN001200
C         AS LINES CV018150 AND CV027750 RESPECTIVELY.                   RN001300
C                                                                        RN001400
C     SUBROUTINE CRS                                                     RN001500
C                                                                        RN001600
C      CALL RUN(TX1,TX1,TX1,CHI,TX1,TX2,DAY,ISC,RNG)                     RN001700
C      CALL RUN(TX1,TX1,TX1,CHI,TX1,TX2,DAY,ISC,RNG)                     RN001800
C         AS LINES CR013750 AND CR071050 RESPECTIVELY.                   RN001900
C                                                                        RN002000
C                                                                        RN002100
C    TO OPTION THE USE OF THE SUBROUTINE, THE FIRST OF THE TWO BLANK     RN002200
C    CARDS AT THE VERY END OF THE CRSTER INPUT DECK IS USED. ANY         RN002300
C    CHARACTER IN CC 1-4 WILL PRODUCE 3-HOUR RUNNING AVERAGES; ANY       RN002400
C    CHARACTER IN CC 5-8 WILL PRODUCE 8-HOUR RUNNING AVERAGES; ANY       RN002500
C    CHARACTER IN CC 9-12 WILL PRODUCE 24-HOUR RUNNING AVERAGES. FOR     RN002600
C    EACH AVERAGING TIME CHOSEN, A HIGHEST, SECOND HIGHEST AND HIGH-50   RN002700
C    TABLE WILL BE PRINTED.                                              RN002800
C                                                                        RN002900
C                                                                        RN003000
C    THE SECOND HIGHEST RUNNING AVERAGES CALCULATED ARE DETERMINED       RN003100
C    USING THE PROCEDURE OUTLINED UNDER ISSUE 7B IN THE OAQPS GUIDELINE  RN003200
C    DOCUMENT ENTITLED "GUIDELINES FOR THE INTERPRETATION OF AIR         RN003300
C    QUALITY STANDARDS, NO. 1.2-008 (REVISED FEBRUARY 1977)".            RN003400
C                                                                        RN003500
C                                                                        RN003600
C    RESTRICTIONS                                                        RN003700
C                                                                        RN003800
C       1) IF THE SOURCE CONTRIPUTION OPTION IN CRSTER IS TURNED         RN003900
C          ON (ISC=1), THE RUNNING AVERAGE OPTION WILL DEFAULT TO "OFF". RN004000
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C
C       2) ANY NUMBER OF DAYS OF THE YEAR MAY BE RUN FOR CRSTER IN          RNL04100
C          CONJUNCTION WITH SUBROUTINE RUN BUT ALL OF THE DAYS SELECTED     RN004200
C          MUST DEFINE A CONTINUOUS PERIOD OF DAYS (NO GAPS) IN ORDER       RN004300
C          FOR THE RUNNING AVERAGE RESULTS TO BE MEANINGFUL.                RN004400
C                                                                           RN004500
C                                                                           RN004600
C                                                                           RN004700
C                                                                           RN004800
C                                                                           RN004900
C                                                                           RN005000
      DIMENSION CHI(180),TX1(6),TX2(2),PNG(5),IDAY(366)                     RN005100
      DIMENSION CONC(180),AVG3(180),AVG8(180),AVG24(180),                   RN005200
     *AWK(180),IAWK(180),JAWK(180),HI503(51),IH503(51),ID503(51),           RN005300
     *HI508(51),IH508(51),ID508(51),HI524(51),                              RN005400
     *IH524(51),ID524(51),JMAX1U(180),DMAXUN(180),                          RN005500
     *TOT3(180),TOT8(180),TOT24(180),                                       RN005600
     *RTAB3(180,4),RTAB8(180,9),RTAB24(180,25),                             RN005700
     *ITID3(180,4),ITID8(180,9),ITID24(180,25),                             RN005800
     *VAL3(180,3),VAL8(180,8),VAL24(180,24),IUNI(180)                       RN005900
      INTEGER*2 SAB(180,2),SUB(36,5)                                        RN006000
      DATA AA,BB,CC /'   ','   ','   '/                                     RN006100
      DATA N,ID,IRA3,IRA8,IRA24 /5*0/                                       RN006200
      DATA SAB/36*1,36*2,36*3,36*4,36*5,                                    RN006300
     *1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,             RN006400
     *23,24,25,26,27,28,29,30,31,32,33,34,35,36,1,2,3,4,5,6,7,8,9,10,11,RN006500
     *12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,RN006600
     *34,35,36,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,RN006700
     *23,24,25,26,27,28,29,30,31,32,33,34,35,36,1,2,3,4,5,6,7,8,9,10,11,RN006800
     *12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,RN006900
     *34,35,36,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,RN007000
     *23,24,25,26,27,28,29,30,31,32,33,34,35,36/                            RN007100
      DATA SUB/1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,RN007200
     *23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,RN007300
     *45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,RN007400
     *67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,RN007500
     *89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107, RN007600
     *108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,  RN007700
     *124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,  RN007800
     *140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,  RN007900
     *156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,  RN008000
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     *172,173,174,175,176,177,178,179,180/                                    RNU08100
      IF(ISC.EQ.1)RETURN                                                      RNU08200
      N=N+1                                                                   RNU08300
      IF(N.EQ.2)RETURN                                                        RNU08400
      IF(N.GT.2)GO TO 1000                                                    RNU08500
      IF(A.NE.AA)IRA3=1                                                       RNU08600
      IF(B.NE.BB)IRA8=1                                                       RNU08700
      IF(C.NE.CC)IRA24=1                                                      RNU08800
      DO 1 I=1,365                                                            RNU08900
    1 ID=ID+IDAY(I)*24                                                        RNU09000
      RETURN                                                                  RNU09100
 1000 IF(IRA3.EQ.1.OR.IRA8.EQ.1.OR.IRA24.EQ.1) GO TO 2000                     RNU09200
      RETURN                                                                  RNU09300
 2000 IDD=N-3                                                                 RNU09400
      IF(ID.EQ.IDD) GO TO 3000                                                RNU09500
C                                                                             RNU09600
C                                                                             RNU09700
C                                                                             RNU09800
C***COMMENCE CALCULATING RUNNING AVERAGES FOR SELECTED AVERAGING TIMES.       RNU09900
C                                                                             RNU10000
C                                                                             RNU10100
C                                                                             RNU10200
      DO 5 LR=1,180                                                           RNU10300
      CONC(LR)=CHI(LR)                                                        RNU10400
    5 CONTINUE                                                                RNU10500
      ISUMR=ISUMR+1                                                           RNU10600
      IF(IRA3.EQ.0)GO TO 40                                                   RNU10700
C                                                                             RNU10800
C***CALCULATE 3-HOUR RUNNING AVERAGES.                                        RNU10900
C                                                                             RNU11000
      IF(ISUMR.GE.3)GO TO 20                                                  RNU11100
      DO 10 LR=1,180                                                          RNU11200
      VAL3(LR,ISUMR+1)=CONC(LR)                                               RNU11300
      TOT3(LR)=TOT3(LR)+CONC(LR)                                              RNU11400
   10 CONTINUE                                                                RNU11500
      GO TO 40                                                                RNU11600
   20 DO 25 LR=1,180                                                          RNU11700
      TOT3(LR)=TOT3(LR)-VAL3(LR,1)+CONC(LR)                                   RNU11800
      AVG3(LR)=TOT3(LR)/3.                                                    RNU11900
      DO 24 IQ=1,2                                                            RNU12000
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      VAL3(LR,IQ)=VAL3(LR,IQ+1)                                          RNC12100
   24 CONTINUE                                                           RNC12200
      VAL3(LR,3)=CONC(LR)                                                RNC12300
   25 CONTINUE                                                           RNC12400
      DO 29 LR=1,180                                                     RNC12500
      DO 28 IOUR=1,4                                                     RNC12600
      IF(AVG3(LR).LT.RTAB3(LR,IOUR))GO TO 28                             RNC12700
      IF(IOUR.EQ.4)GO TO 23                                              RNC12800
      IP=4-IOUR                                                          RNC12900
      DO 27 LTS=1,IP                                                     RNC13000
      LS=5-LTS                                                           RNC13100
      RTAB3(LR,LS)=RTAB3(LR,LS-1)                                        RNC13200
      ITID3(LR,LS)=ITID3(LR,LS-1)                                        RNC13300
   27 CONTINUE                                                           RNC13400
   23 RTAB3(LR,IOUR)=AVG3(LR)                                            RNC13500
      ITID3(LR,IOUR)=ISUMR-2                                             RNC13600
      GO TO 29                                                           RNC13700
   28 CONTINUE                                                           RNC13800
   29 CONTINUE                                                           RNC13900
      DO 45 LR=1,180                                                     RNC14000
      DO 44 LT=1,50                                                      RNC14100
      IF(AVG3(LR).LE.HI503(LT))GO TO 44                                  RNC14200
      IF(LT.EQ.50)GO TO 47                                               RNC14300
      IP=50-LT                                                           RNC14400
      DO 43 LTS=1,IP                                                     RNC14500
      LS=51-LTS                                                          RNC14600
      HI503(LS)=HI503(LS-1)                                              RNC14700
      IH503(LS)=IH503(LS-1)                                              RNC14800
      ID503(LS)=ID503(LS-1)                                              RNC14900
   43 CONTINUE                                                           RNC15000
   47 HI503(LT)=AVG3(LR)                                                 RNC15100
      IH503(LT)=ISUMR-2                                                  RNC15200
      ID503(LT)=LR                                                       RNC15300
      GO TO 45                                                           RNC15400
   44 CONTINUE                                                           RNC15500
   45 CONTINUE                                                           RNC15600
   40 IF(IRA8.EQ.0)GO TO 70                                              RNC15700
C                                                                        RNC15800
C***CALCULATE 8-HOUR RUNNING AVERAGES.                                   RNC15900
C                                                                        RNC16000
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      IF(ISUMR.GE.8)GO TO 50                                          RN016100
      DO 46 LR=1,180                                                  RN016200
      VAL8(LR,ISUMR+1)=CONC(LR)                                       RN016300
      TOT8(LR)=TOT8(LR)+CONC(LR)                                      RN016400
   46 CONTINUE                                                        RN016500
      GO TO 70                                                        RN016600
   50 DO 52 LR=1,180                                                  RN016700
      TOT8(LR)=TOT8(LR)-VAL8(LR,1)+CONC(LR)                           RN016800
      AVG8(LR)=TOT8(LR)/8.                                            RN016900
      DO 51 IQ=1,7                                                    RN017000
      VAL8(LR,IQ)=VAL8(LR,IQ+1)                                       RN017100
   51 CONTINUE                                                        RN017200
      VAL8(LR,8)=CONC(LR)                                             RN017300
   52 CONTINUE                                                        RN017400
      DO 60 LR=1,180                                                  RN017500
      DO 59 IOUR=1,9                                                  RN017600
      IF(AVG8(LR).LE.RTAB8(LR,IOUR))GO TO 59                          RN017700
      IF(IOUR.EQ.9)GO TO 57                                           RN017800
      IP=9-IOUR                                                       RN017900
      DO 58 LTS=1,IP                                                  RN018000
      LS=10-LTS                                                       RN018100
      RTAB8(LR,LS)=RTAB8(LR,LS-1)                                     RN018200
      ITID8(LR,LS)=ITID8(LR,LS-1)                                     RN018300
   58 CONTINUE                                                        RN018400
   57 RTAB8(LR,IOUR)=AVG8(LR)                                         RN018500
      ITID8(LR,IOUR)=ISUMR-7                                          RN018600
      GO TO 60                                                        RN018700
   59 CONTINUE                                                        RN018800
   60 CONTINUE                                                        RN018900
      DO 65 LR=1,180                                                  RN019000
      DO 64 LT=1,50                                                   RN019100
      IF(AVG8(LR).LE.HI508(LT))GO TO 64                               RN019200
      IF(LT.EQ.50)GO TO 67                                            RN019300
      IP=50-LT                                                        RN019400
      DO 63 LTS=1,IP                                                  RN019500
      LS=51-LTS                                                       RN019600
      HI508(LS)=HI508(LS-1)                                           RN019700
      IH508(LS)=IH508(LS-1)                                           RN019800
      ID508(LS)=ID508(LS-1)                                           RN019900
   63 CONTINUE                                                        RN020000
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   67 HI508(LT)=AVG8(LR)                                                RNC20100
      IH508(LT)=ISUMR-7                                                 RNC20200
      ID508(LT)=LR                                                      RNC20300
      GO TO 65                                                          RNC20400
   64 CONTINUE                                                          RNC20500
   65 CONTINUE                                                          RNC20600
   70 IF(IRA24.EQ.0)GO TO 4081                                          RNC20700
C                                                                       RNC20800
C***CALCULATE 24-HOUR RUNNING AVERAGES.                                 RNC20900
C                                                                       RNC21000
      IF(ISUMR.GE.24)GO TO 71                                           RNC21100
      DO 72 LR=1,180                                                    RNC21200
      VAL24(LR,ISUMR+1)=CONC(LR)                                        RNC21300
      TOT24(LR)=TOT24(LR)+CONC(LR)                                      RNC21400
   72 CONTINUE                                                          RNC21500
      GO TO 4081                                                        RNC21600
   71 DO 74 LR=1,180                                                    RNC21700
      TOT24(LR)=TOT24(LR)-VAL24(LR,1)+CONC(LR)                          RNC21800
      AVG24(LR)=TOT24(LR)/24.                                           RNC21900
      DO 73 IQ=1,23                                                     RNC22000
      VAL24(LR,IQ)=VAL24(LR,IQ+1)                                       RNC22100
   73 CONTINUE                                                          RNC22200
      VAL24(LR,24)=CONC(LR)                                             RNC22300
   74 CONTINUE                                                          RNC22400
      DO 80 LR =1,180                                                   RNC22500
      DO 79 IOUR=1,25                                                   RNC22600
      IF(AVG24(LR).LE.RTAB24(LR,IOUR))GO TO 79                          RNC22700
      IF(IOUR.EQ.25)GO TO 75                                            RNC22800
      IP=25-IOUR                                                        RNC22900
      DO 78 LTS=1,IP                                                    RNC23000
      LS=26-LTS                                                         RNC23100
      RTAB24(LR,LS)=RTAB24(LR,LS-1)                                     RNC23200
      ITID24(LR,LS)=ITID24(LR,LS-1)                                     RNC23300
   78 CONTINUE                                                          RNC23400
   75 RTAB24(LR,IOUR)=AVG24(LR)                                         RNC23500
      ITID24(LR,IOUR)=ISUMR-23                                          RNC23600
      GO TO 80                                                          RNC23700
   79 CONTINUE                                                          RNC23800
   80 CONTINUE                                                          RNC23900
      DO 85 LR=1,180                                                    RNC24000
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      DO 84 LT=1,50                                                          RN024100
      IF(AVG24(LR).LE.HI5024(LT)) GO TO 84                                   RN024200
      IF (LT.EQ.50)GO TO 87                                                  RN024300
      IP=50-LT                                                               RN024400
      DO 83 LTS=1,IP                                                         RN024500
      LS=51-LTS                                                              RN024600
      HI5024(LS)=HI5024(LS-1)                                                RN024700
      IH5024(LS)=IH5024(LS-1)                                                RN024800
      ID5024(LS)=ID5024(LS-1)                                                RN024900
   83 CONTINUE                                                               RN025000
   87 HI5024(LT)=AVG24(LR)                                                   RN025100
      IH5024(LT)=ISUMR-23                                                    RN025200
      ID5024(LT)=LR                                                          RN025300
      GO TO 85                                                               RN025400
   84 CONTINUE                                                               RN025500
   85 CONTINUE                                                               RN025600
      RETURN                                                                 RN025700
C                                                                            RN025800
C                                                                            RN025900
C                                                                            RN026000
C***COMMENCE WRITING OUTPUT TABLES FOR SELECTED AVERAGEING TIMES.            RN026100
C                                                                            RN026200
C                                                                            RN026300
C                                                                            RN026400
 3000 IF(IRA24.EQ.0)GO TO 9135                                               RN026500
      INM=24                                                                 RN026600
 9101 CONTINUE                                                               RN026700
C                                                                            RN026800
C***TRANSFER 24-HOUR TABLES FOR PRINTING.                                    RN026900
C                                                                            RN027000
      DO 9100 LR=1,180                                                       RN027100
      DO 9105 J=1,INM                                                        RN027200
      K=J+1                                                                  RN027300
 9103 K=K-1                                                                  RN027400
      IF(K.EQ.0)GO TO 9105                                                   RN027500
      IF((ABS(ITID24(LR,K)-ITID24(LR,J+1))).LT.INM)GO TO 9103                RN027600
      RTAB24(LR,2)=RTAB24(LR,J+1)                                            RN027700
      ITID24(LR,2)=ITID24(LR,J+1)                                            RN027800
      GO TO 9100                                                             RN027900
 9105 CONTINUE                                                               RN028000
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 9100 CONTINUE                                                          RNL28100
C                                                                       RNL28200
C***GENERALIZED ROUTINE TO PREPARE **HIGHEST** TABLES FOR EACH          RN028300
C    AVERAGING TIME FOR PRINTING.                                       RN028400
C                                                                       RN028500
      DO 9110 LR=1,180                                                  RNL28600
      AWK(LR)=RTA924(LR,1)                                              RN028700
      IAWK(LR)=ITID24(LR,1)/24                                          RNL28800
      IWK=IAWK(LR)*24                                                   RN028900
      JAWK(LR)=ITID24(LR,1)-IWK                                         RN029000
      IAWK(LR)=IAWK(LR)+1                                               RN029100
      IF(JAWK(LR).EQ.0)JAWK(LR)=24                                      RN029200
      IF(JAWK(LR).EQ.0)IAWK(LR)=IAWK(LR)-1                              RN029300
 9110 CONTINUE                                                          RN029400
      IJN=0                                                             RN029500
      DO 9106 IJER=1,36                                                 RN029600
      DO 9106 IJFS=1,5                                                  RN029700
      IJN=IJN+1                                                         RN029800
      IJK=SUB(IJER,IJFS)                                                RN029900
      DMAXUN(IJN)=AWK(IJK)                                              RN030000
      JMAX1U(IJN)=IAWK(IJK)                                             RN030100
      IUNI(IJN)=JAWK(IJK)                                               RN030200
 9106 CONTINUE                                                          RN030300
C                                                                       RN030400
C***GENERALIZED ROUTINE FOR PRINTING **HIGHEST** TABLES FOR EACH        RN030500
C    AVERAGING TIME.                                                    RN030600
C                                                                       RN030700
      WRITE(6,6050)TX1,TX2                                              RN030800
 6050 FORMAT(1H1,2X,'PLANT NAME: ',6A4,'  POLLUTANT: ',2A4,             RN030900
     *'  EMISSION UNITS: GM/SEC  ','  AIR QUALITY UNITS: GM/M**3'//)    RN031000
      WRITE(6,9080)INM,RNG                                              RN031100
 9080 FORMAT(1X,T17,'HIGHEST ',I2,'-HOUR RUNNING AVERAGE',              RN031200
     *' CONCENTRATIONS AT EACH RECEPTOR'//                              RN031300
     *1X,T4,'RANGE   ',4(F5.1,' KM',17X),F5.1,' KM'/                    RN031400
     *1X ,T2,'DIR'/3X,5(14X,'(DAY,ST HR)'))                            RN031500
      DO 9120 I=1,36                                                    RN031600
      IFR=I*5-4                                                         RN031700
      ITO=I*5                                                           RN031800
      WRITE(6,8040)I,(DMAXUN(J),JMAX1U(J),IUNI(J),J=IFR,ITO)           RN031900
 8040 FORMAT(1X,T3,I2,T6,5(1PE11.4,' (',I3,',',I2,')',5X))              RN032000
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 9120 CONTINUE                                                          RN032100
C                                                                       RN032200
C***GENERALIZED ROUTINE FOR PREPARING **SECOND HIGHEST** TABLES FOR     RN032300
C    EACH AVERAGING TIME FOR PRINTING.                                  RN032400
C                                                                       RN032500
      DO 9122 LR=1,180                                                  RN032600
      AWK(LR)=RTAB24(LR,2)                                              RN032700
      IAWK(LR)=ITID24(LR,2)/24                                          RN032800
      IWK=IAWK(LR)*24                                                   RN032900
      JAWK(LR)=ITID24(LR,2)-IWK                                         RN033000
      IAWK(LR)=IAWK(LR)+1                                               RN033100
      IF(JAWK(LR).EQ.0)JAWK(LR)=24                                      RN033200
      IF(JAWK(LR).EQ.0)IAWK(LR)=IAWK(LR)-1                              RN033300
 9122 CONTINUE                                                          RN033400
      IJN=0                                                             RN033500
      DO 9104 IJER=1,36                                                 RN033600
      DO 9104 IJES=1,5                                                  RN033700
      IJN=IJN+1                                                         RN033800
      IJK=SUB(IJER,IJES)                                                RN033900
      DMAXUN(IJN)=AWK(IJK)                                              RN034000
      JMAX1U(IJN)=IAWK(IJK)                                             RN034100
      IUNI(IJN)=JAWK(IJK)                                               RN034200
 9104 CONTINUE                                                          RN034300
C                                                                       RN034400
C***GENERALIZED ROUTINE FOR PRINTING **SECOND HIGHEST** TABLES FOR      RN034500
C    EACH AVERAGING TIME.                                               RN034600
C                                                                       RN034700
      WRITE(6,6050)TX1,TX2                                              RN034800
      WRITE(6,9081)INM,RNG                                              RN034900
 9081 FORMAT(1X,T17,'SECOND HIGHEST ',I2,'-HOUR RUNNING AVERAGE',       RN035000
     *' CONCENTRATIONS AT EACH RECEPTOR'//                               RN035100
     *1X,T4,'RANGE    ',4(F5.1,' KM',17X),F5.1,' KM'/                   RN035200
     *1X ,T2,'DIR'/3X,5(14X,'(DAY,ST HR)'))                             RN035300
      DO 9123 I=1,36                                                    RN035400
      IFR=I*5-4                                                         RN035500
      ITO=I*5                                                           RN035600
      WRITE(6,8040)I,(DMAXUN(J),JMAX1U(J),IUNI(J),J=IFR,ITO)            RN035700
 9123 CONTINUE                                                          RN035800
      WRITE(6,9128)                                                     RN035900
 9128 FORMAT(//////58X,'**** NOTE ****'//                               RN036000
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     *22X,'THE SECOND HIGHEST RUNNING AVERAGES LISTED ON THIS PAGE',     RNG36100
     *' HAVE BEEN DETERMINED USING THE'/                                 RNG36200
     *21X,' PROCEDURE OUTLINED UNDER ISSUE 7B IN THE OAQPS GUIDE',      RNG36300
     *'LINE DOCUMENT ENTITLED GUIDELINES'/                              RNG36400
     *22X,'FOR THE INTERPRETATION OF AIR QUALITY STANDARDS,',           RNG36500
     *' NO. 1.2-008 (REVISED FEBRUARY 1977).')                          RNG36600
C                                                                       RNG36700
C***GENERALIZED ROUTINE FOR PREPARING **HIGH-50** TABLES FOR EACH       RNG36800
C   AVERAGING TIME FOR PRINTING.                                        RNG36900
C                                                                       RNG37000
      WRITE(6,6050)TX1,TX2                                              RNG37100
      WRITE(6,9129)INM,INM                                              RNG37200
 9129 FORMAT(49X,'MAXIMUM ',I2,'-HOUR RUNNING AVERAGE',                 RNG37300
     *' CONCENTRATIONS'//                                               RNG37400
     *41X,'DAY      ',I2,'-HOUR RUNNING AVG    DIRECTION     ',       RNG37500
     *'DISTANCE  START HOUR'/)                                          RNG37600
      DO 9132 I=1,50                                                    RNG37700
      KR2=IH5024(I)/24                                                  RNG37800
      IWK=KR2*24                                                        RNG37900
      KR7=IH5024(I)-IWK                                                 RNG38000
      KR2=KR2+1                                                         RNG38100
      IF(KR7.EQ.0)KR7=24                                                RNG38200
      IF(KR7.EQ.0)KR2=KR2-1                                             RNG38300
      IWK=ID5024(I)                                                     RNG38400
      KR4=SAB(IWK,1)                                                    RNG38500
      GR5=RNG(KR4)                                                      RNG38600
      KR4=SAB(IWK,2)                                                    RNG38700
C                                                                       RNG38800
C***GENERALIZED ROUTINE FOR PRINTING **HIGH-50** TABLES FOR EACH        RNG38900
C   AVERAGING TIME.                                                     RNG39000
C                                                                       RNG39100
 9132 WRITE(6,9130)KR2,HI5024(I),KR4,GR5,KR7                            RNG39200
 9130 FORMAT(40X,I3,1PE20.4,I14,0PF14.2,7X,I3)                          RNG39300
 9135 IF(IRA8.EQ.0)GO TO 9160                                           RNG39400
      IRA8=0                                                            RNG39500
      INM=8                                                             RNG39600
C                                                                       RNG39700
C***TRANSFER 8-HOUR TABLE FOR PRINTING.                                 RNG39800
C                                                                       RNG39900
      DO 9136 I=1,50                                                    RNG40000
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      HI5024(I)=HI508(I)                                                RN040100
      IH5024(I)=IH508(I)                                                RN040200
      ID5024(I)=ID508(I)                                                RN040300
 9136 CONTINUE                                                          RN040400
      DO 9200 I=1,180                                                   RN040500
      DO 9200 J=1,9                                                     RN040600
      RTAB24(I,J)=RTAB8(I,J)                                            RN040700
      ITID24(I,J)=ITID8(I,J)                                            RN040800
 9200 CONTINUE                                                          RN040900
      GO TO 9101                                                        RN041000
 9160 IF(IRA3.EQ.0)GO TO 9260                                           RN041100
      IRA3=0                                                            RN041200
      INM=3                                                             RN041300
C                                                                       RN041400
C***TRANSFER 3-HOUR TABLES FOR PRINTING.                                RN041500
C                                                                       RN041600
      DO 9137 I=1,50                                                    RN041700
      HI5024(I)=HI503(I)                                                RN041800
      IH5024(I)=IH503(I)                                                RN041900
      ID5024(I)=ID503(I)                                                RN042000
 9137 CONTINUE                                                          RN042100
      DO 9230 I=1,180                                                   RN042200
      DO 9230 J=1,4                                                     RN042300
      RTAB24(I,J)=RTAB3(I,J)                                            RN042400
      ITID24(I,J)=ITID3(I,J)                                            RN042500
 9230 CONTINUE                                                          RN042600
      GO TO 9101                                                        RN042700
 9260 CONTINUE                                                          RN042800
 4081 RETURN                                                            RN042900
      END                                                               RN043000
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